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Matsunaga et al.

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(54) **INDOOR UNIT AND AIR-CONDITIONING APPARATUS**

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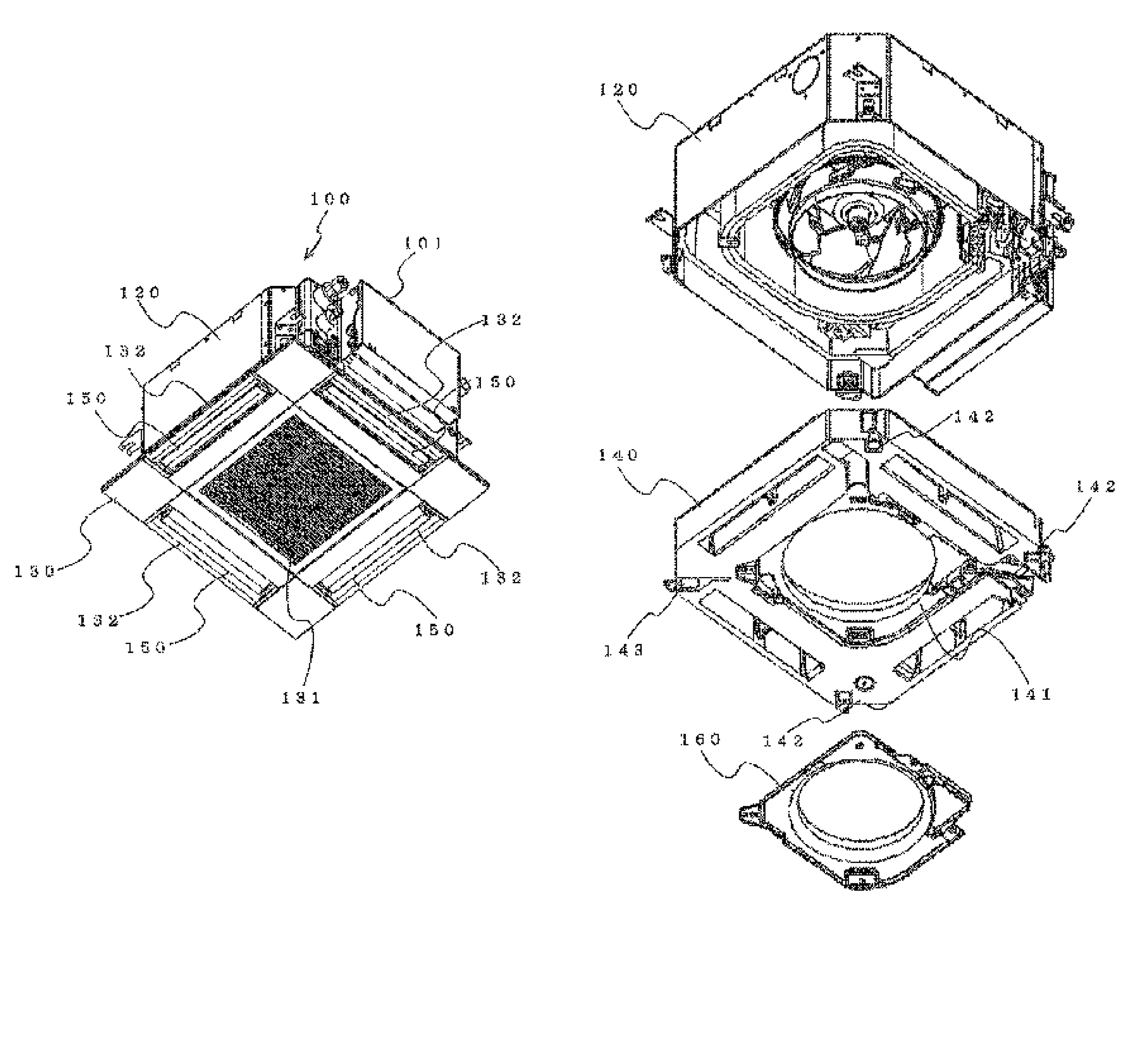
(57) **ABSTRACT**

An indoor unit includes: a casing including a top plate and lateral plates; a motor mounted to a central part on an inner surface side of the top plate; a turbofan fixed to a rotary shaft of the motor and configured to rotate through drive of the motor; a drain pan received in the casing and mounted to the lateral plates of the casing; and a bellmouth mounted to the drain pan and configured to rectify a fluid flowing into the casing. The drain pan includes a positioning fitting having: a casing-fixing threaded hole for allowing the drain pan to be fixed to the casing with a screw; and a bellmouth-fixing threaded hole for allowing the bellmouth to be fixed to the drain pan with a screw.

7 Claims, 10 Drawing Sheets



(51) **Int. Cl.**

F24F 13/22	(2006.01)
F24F 1/0007	(2019.01)
F24F 1/0011	(2019.01)

(52) **U.S. Cl.**

CPC ***F24F 13/222*** (2013.01); *F24F 2001/0037* (2013.01); *F24F 2001/0074* (2013.01); *F24F 2013/227* (2013.01)

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FIG. 1

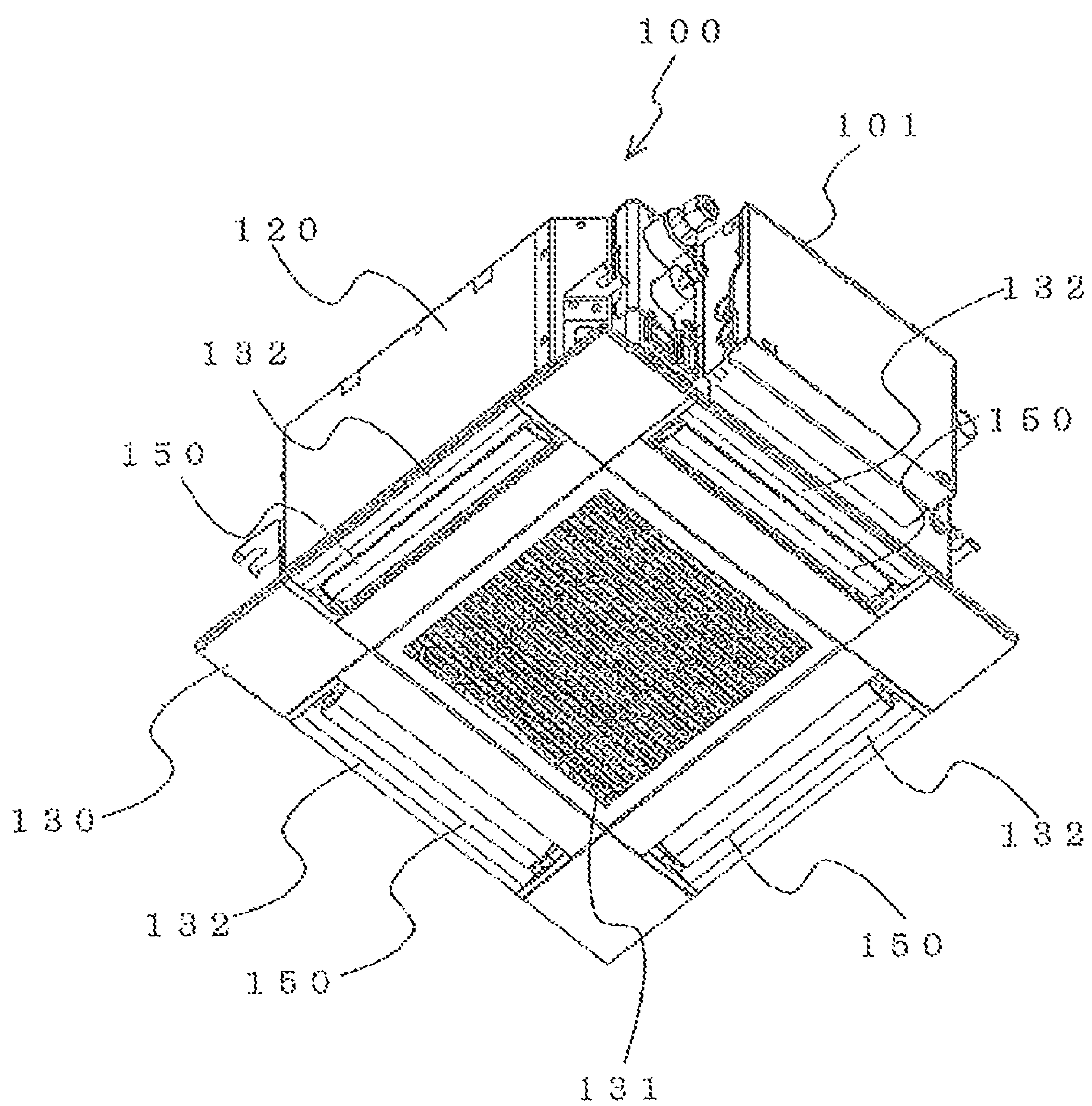


FIG. 2

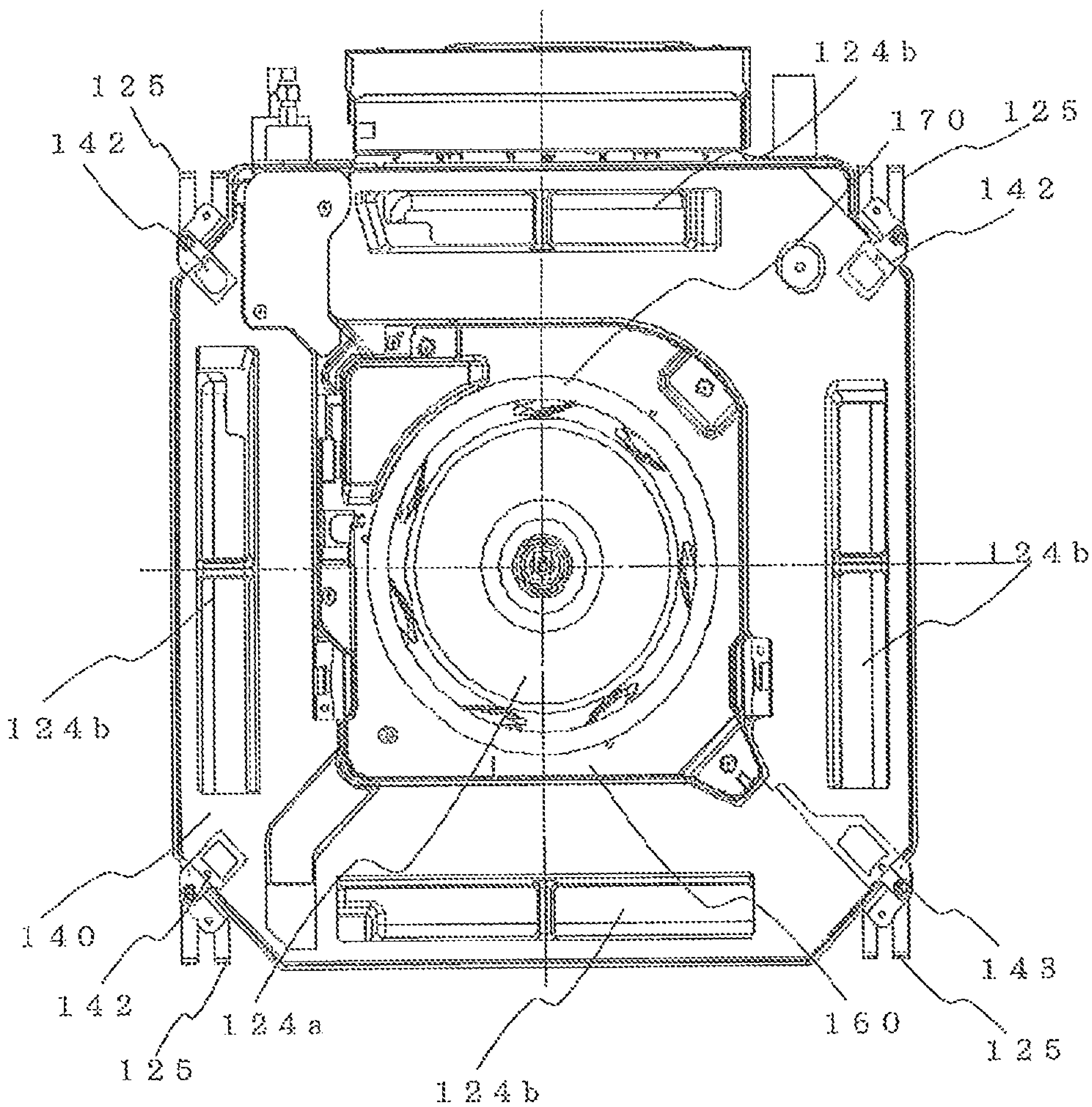

124b
125
170
125
142
142
124b
124b
140
143
142
160
124a
125
125
124b

FIG. 3

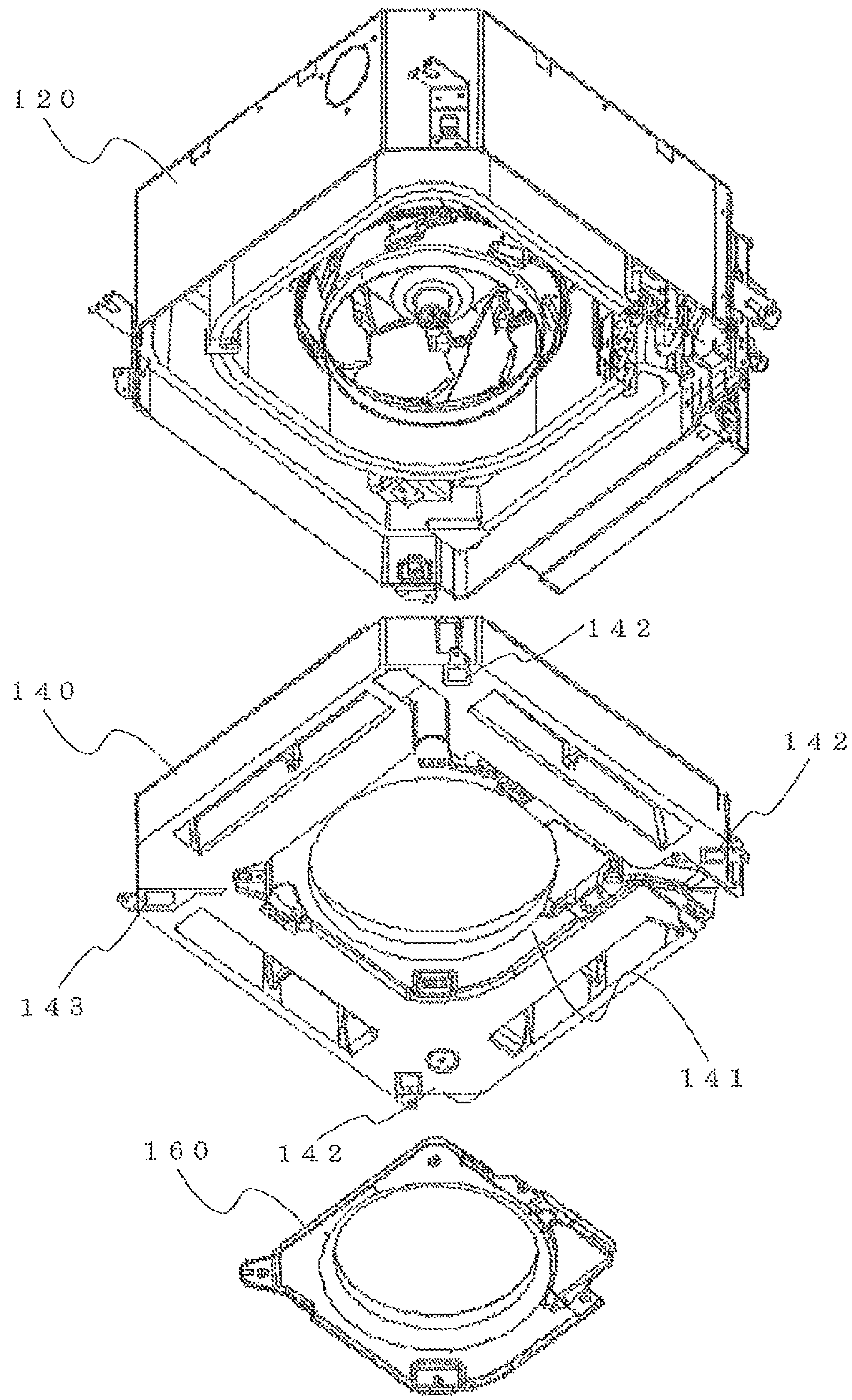


FIG. 4

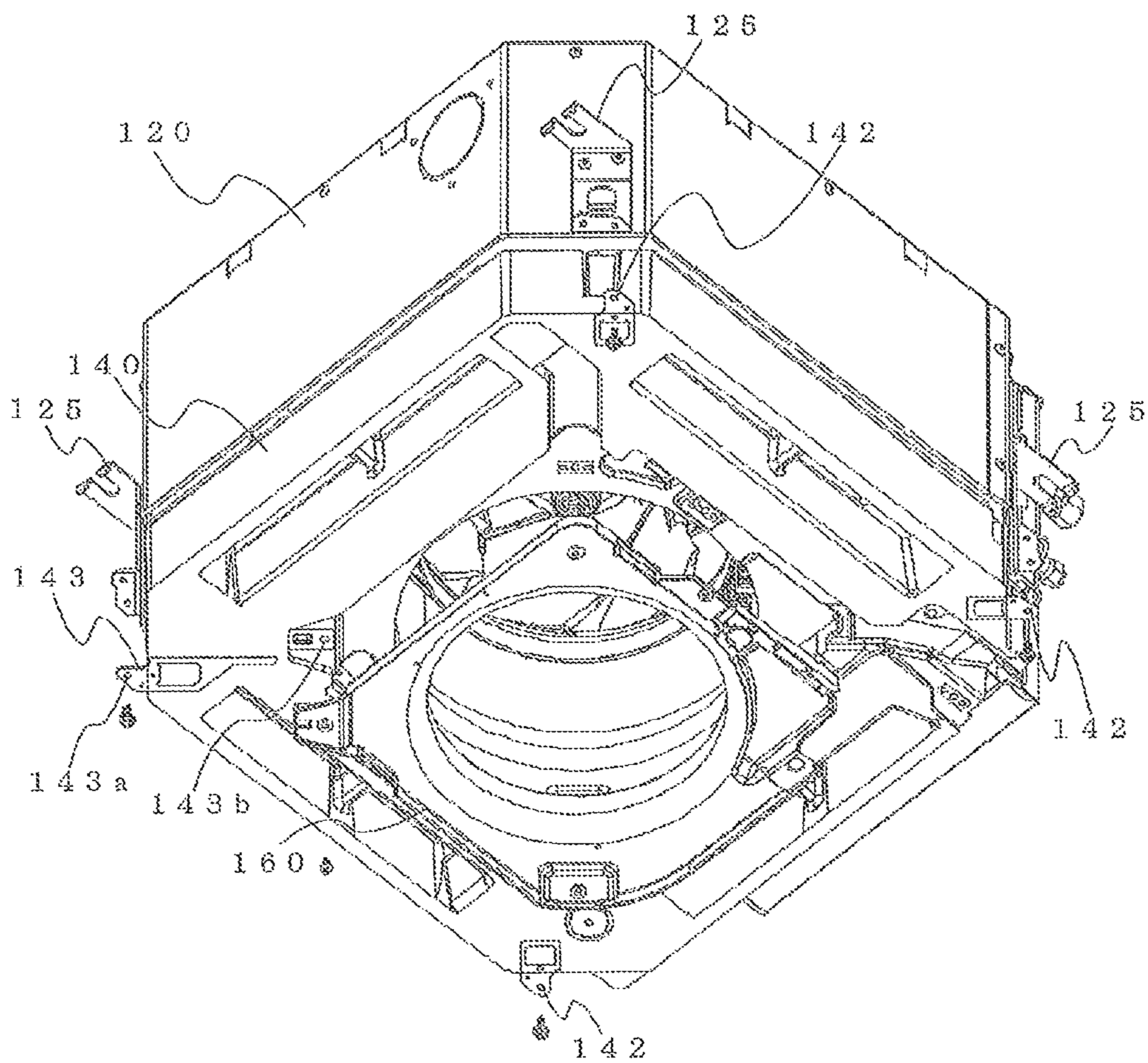


FIG. 5

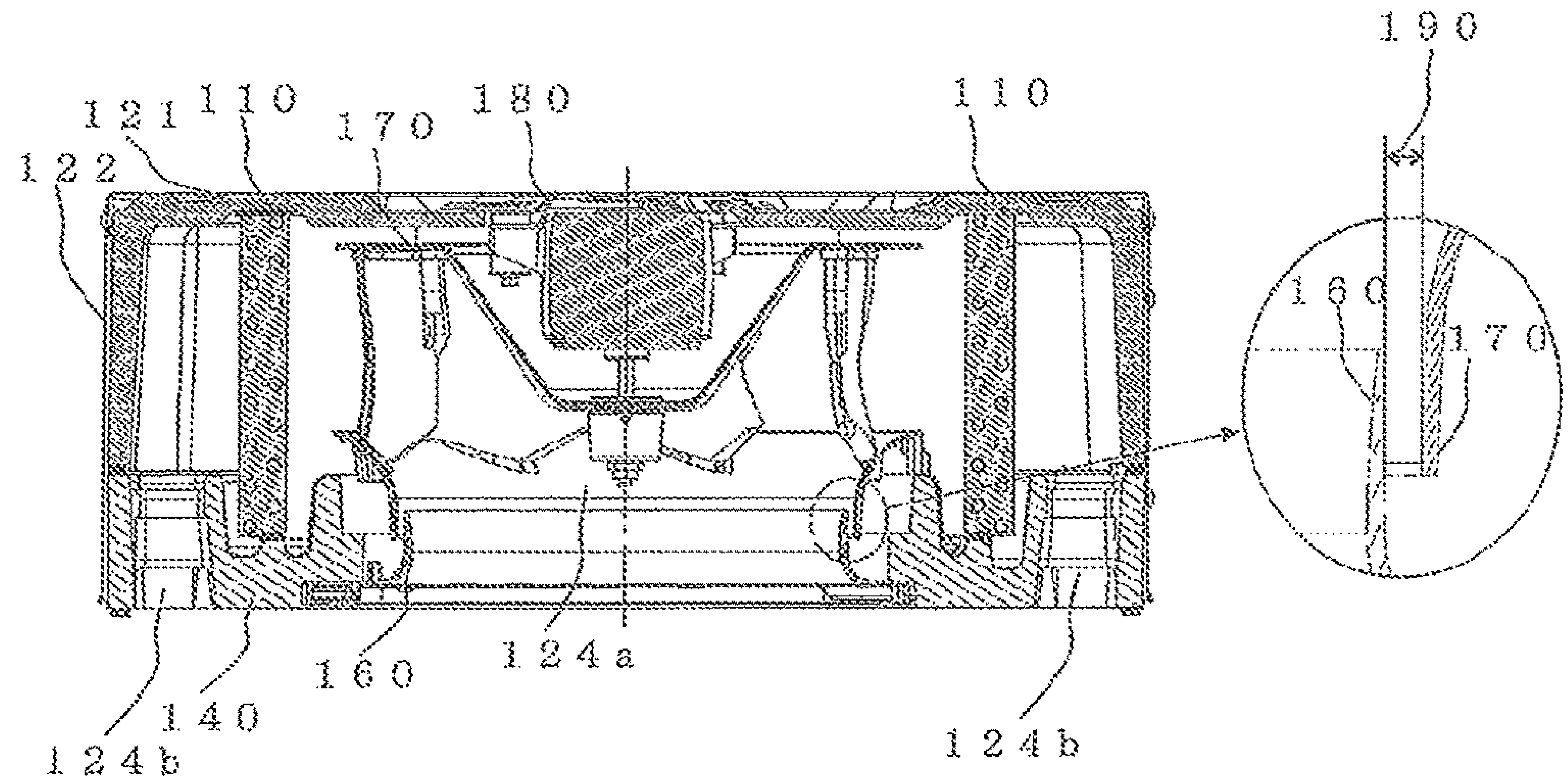

190
121
110
170
180
110
122
160
170
160
124a
140
124b
124b

FIG. 6

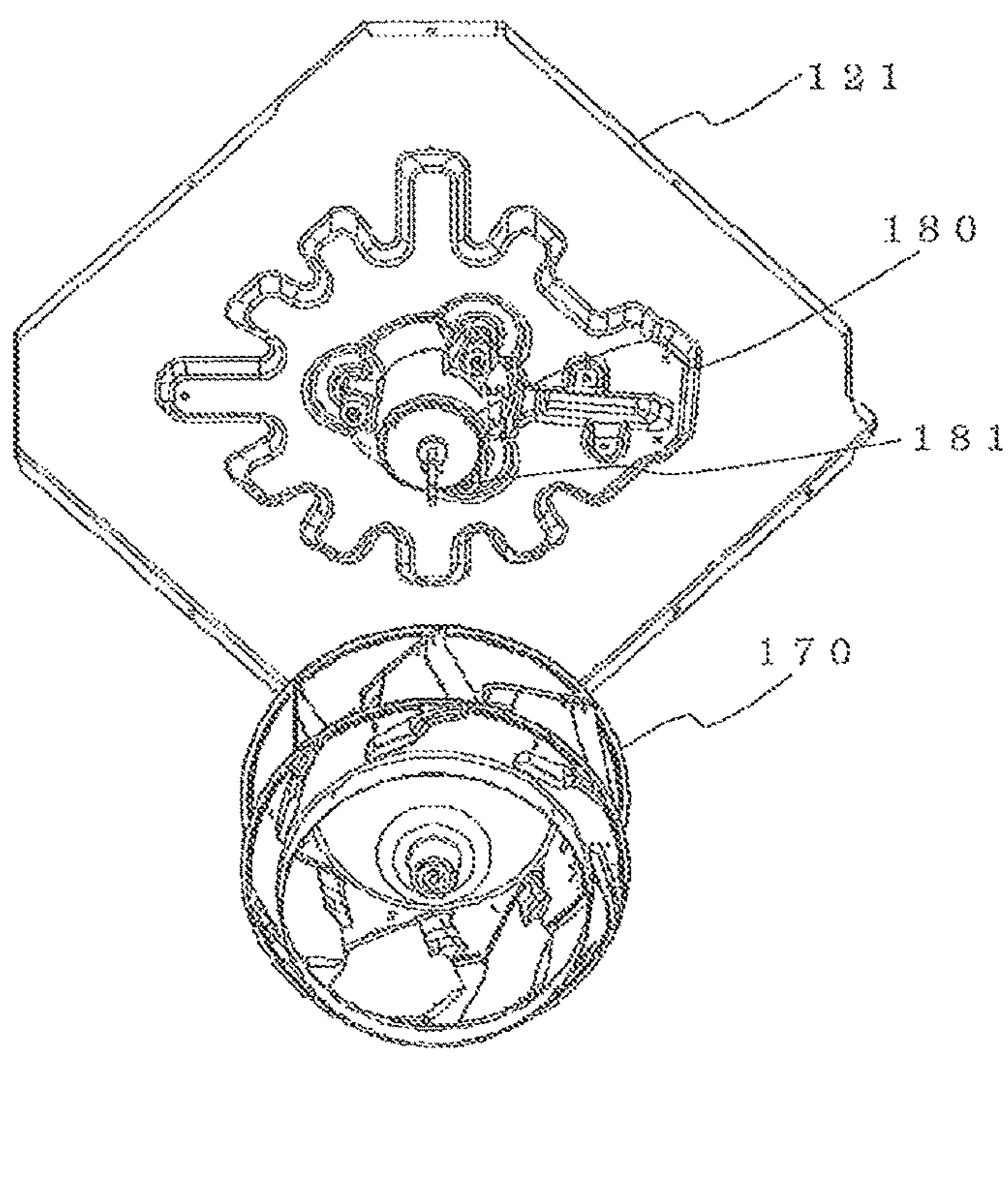

121
180
181
170

FIG. 7

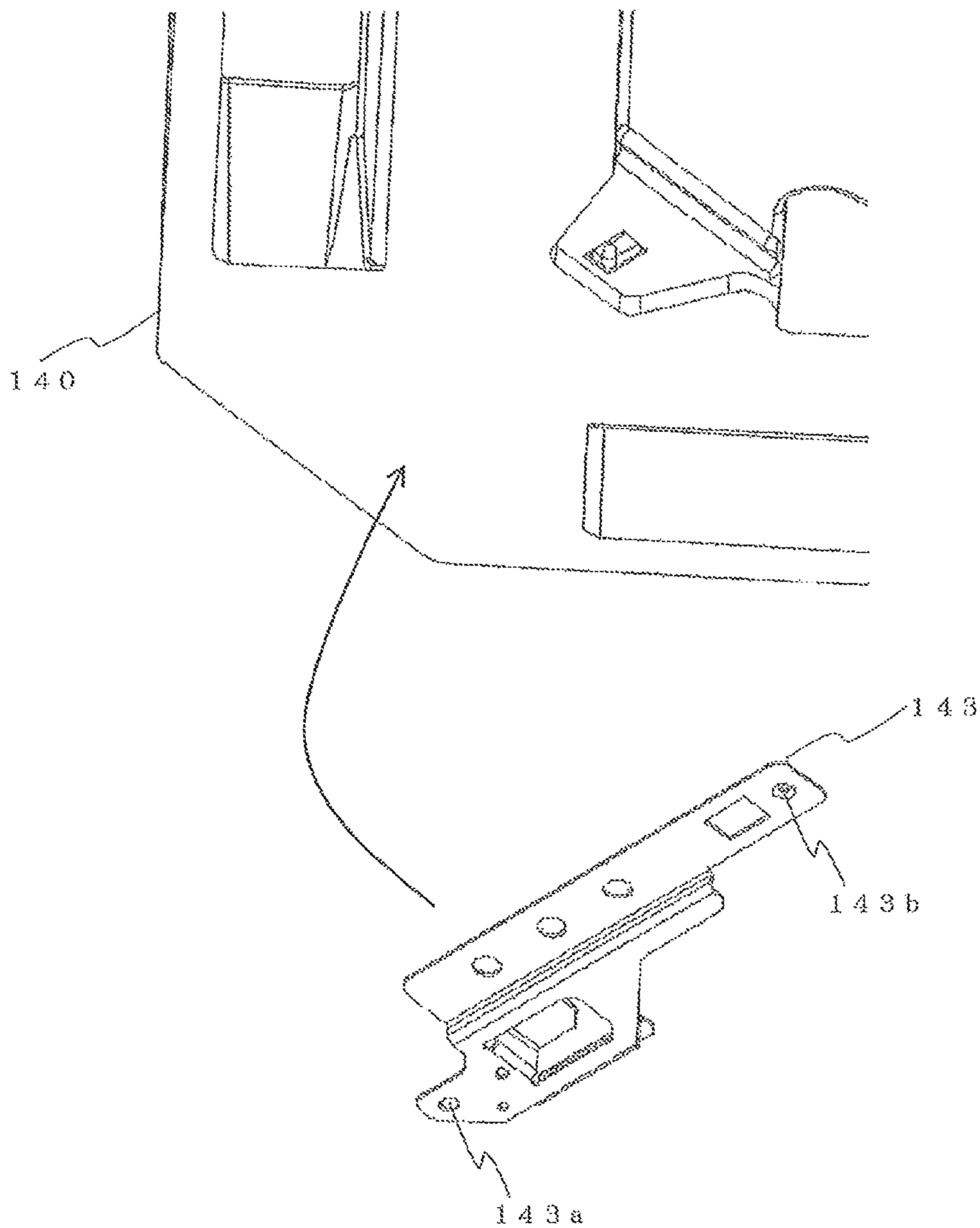


FIG. 8

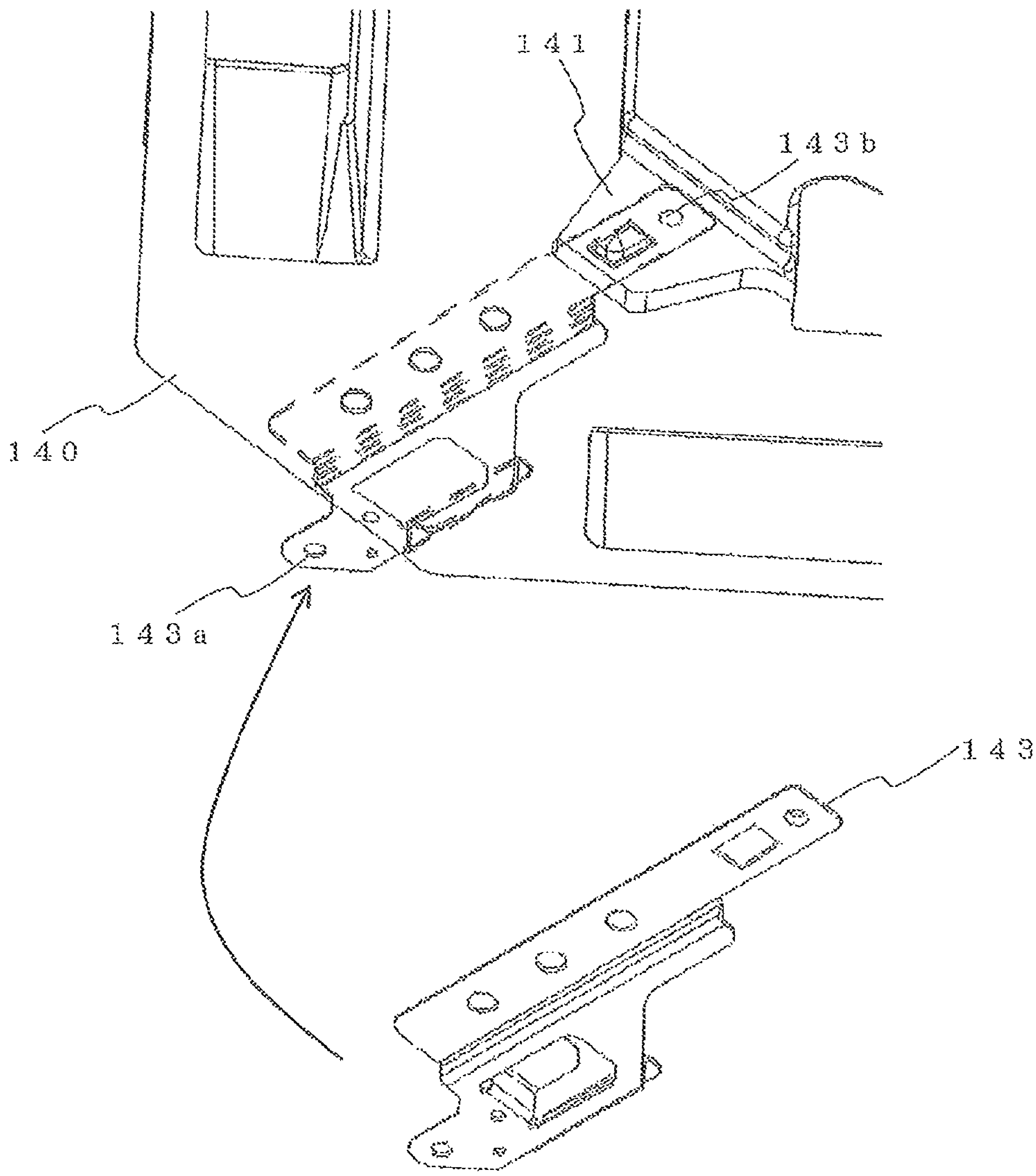


FIG. 9

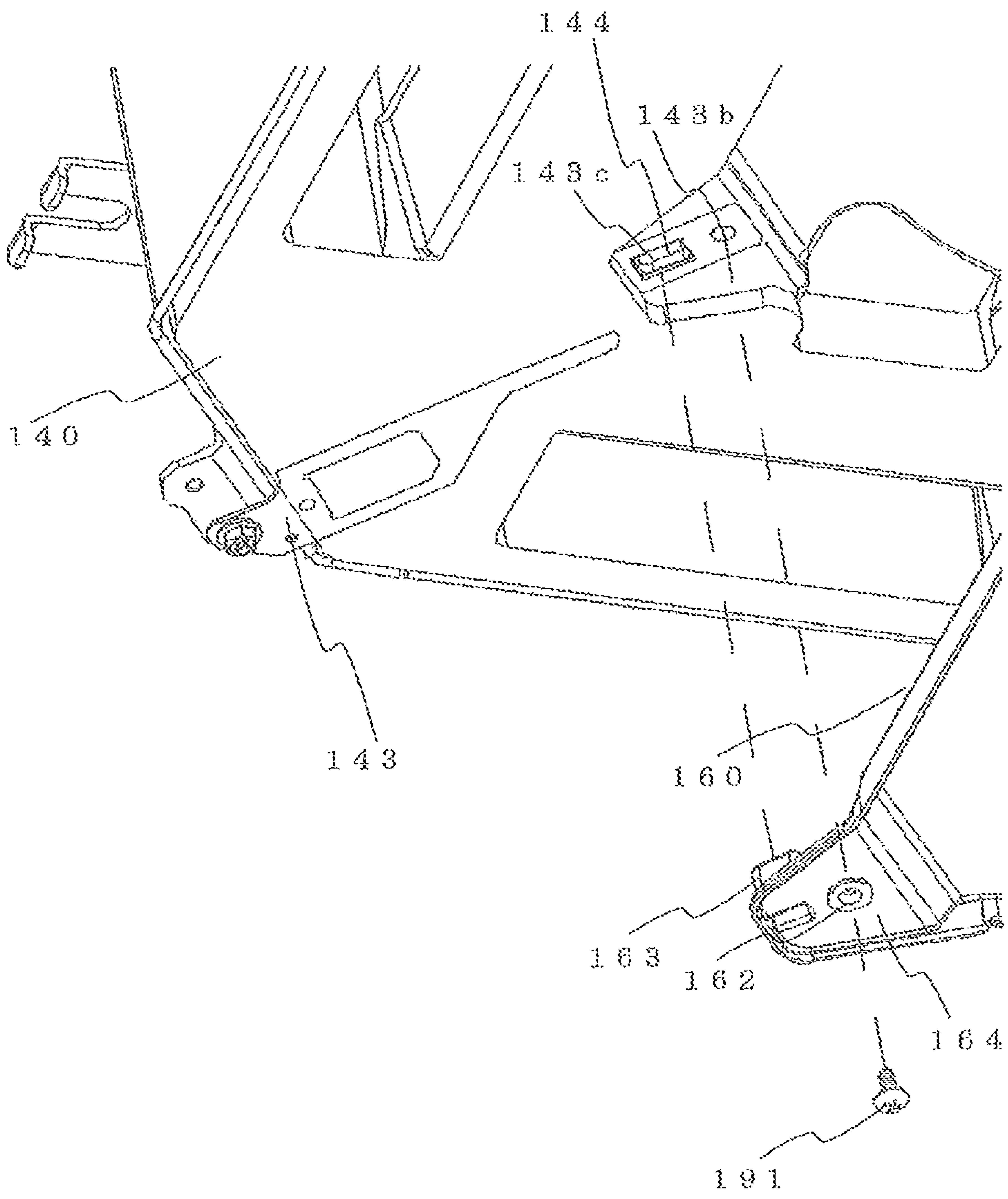


FIG. 10

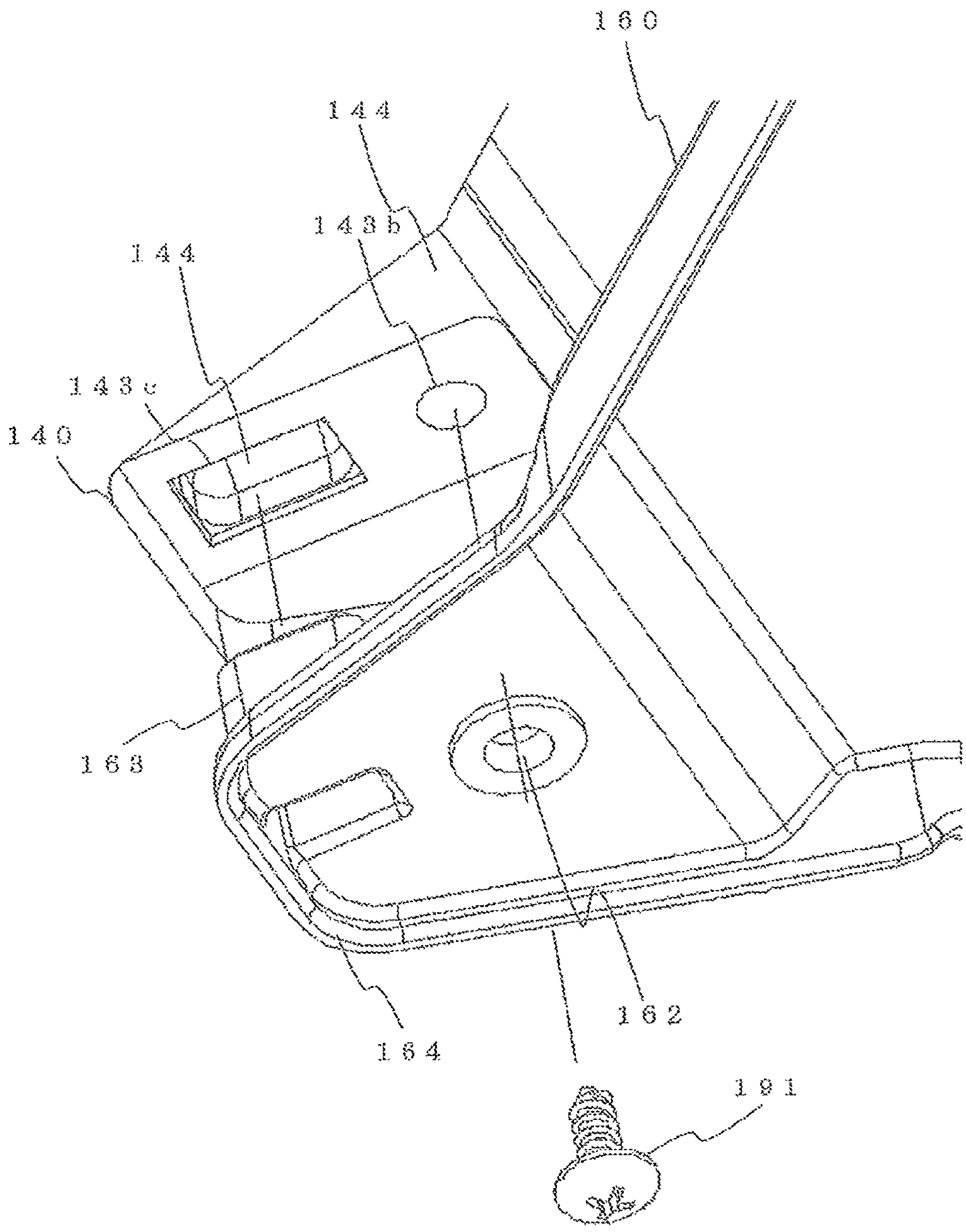
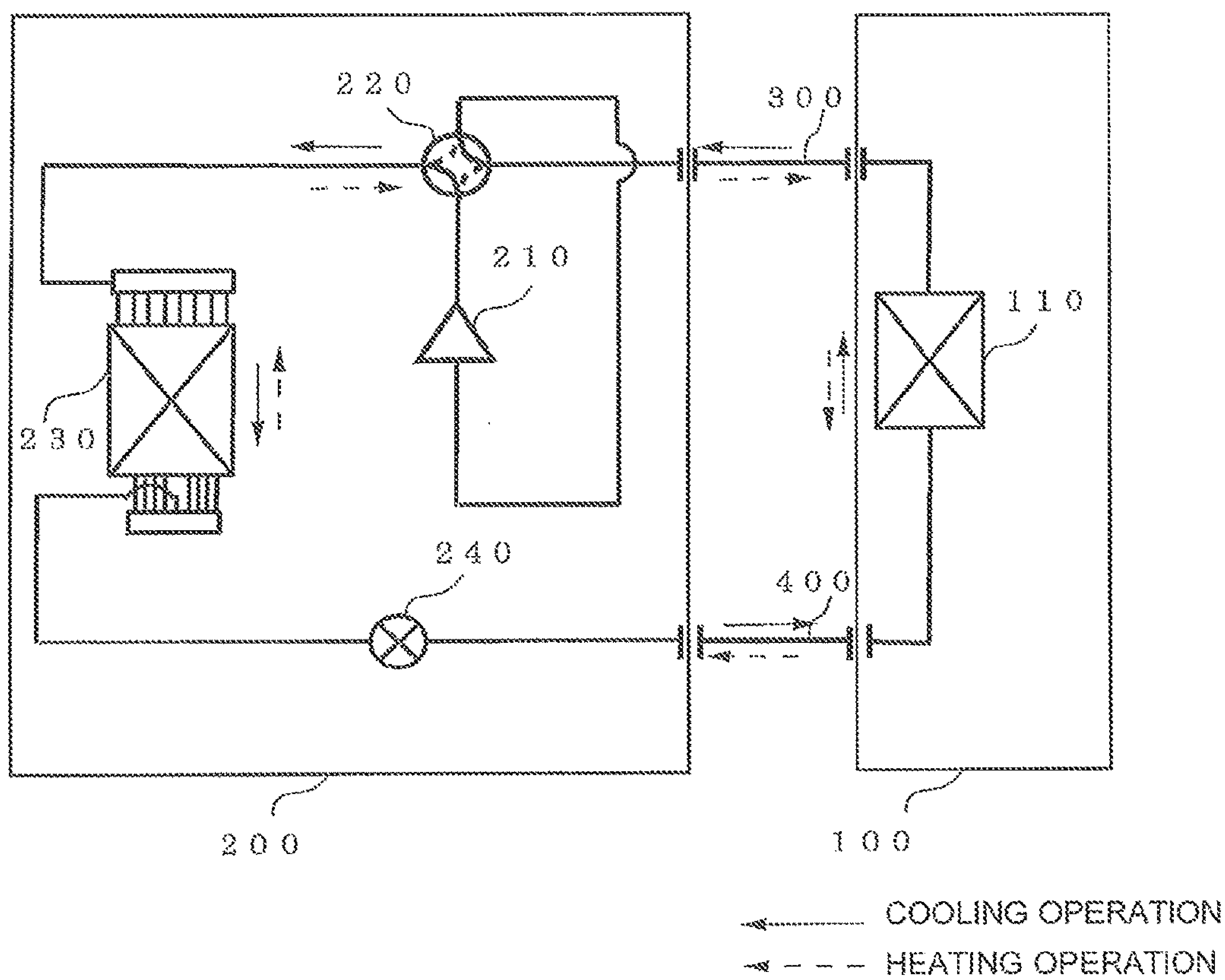


FIG. 11


220
300
210
110
230
240
400
200
100
COOLING OPERATION
HEATING OPERATION

INDOOR UNIT AND AIR-CONDITIONING APPARATUS

CROSS REFERENCE TO RELATED APPLICATION

This application is a U.S. national stage application of International Application No. PCT/JP2015/064426, filed on May 20, 2015, the contents of which are incorporated herein by reference.

TECHNICAL FIELD

The present invention relates to an indoor unit of, for example, an air-conditioning apparatus, and more particularly, to an adjustment of a positional relationship between a bellmouth and a fan.

BACKGROUND

In air-conditioning apparatus and similar apparatus, an indoor unit installed on an indoor side includes a blower configured to blow air by rotating a fan (impeller). Specifically, in an indoor unit of a ceiling concealed type, air flows into the indoor unit through an air inlet at a center on a lower surface side (indoor side), and flows out through air outlets on lateral sides of the lower surface side via the fan, an indoor heat exchanger, and other components. In this case, the indoor unit includes a bellmouth so that the inflow air through the air inlet is rectified and delivered to the fan. The bellmouth is formed, for example, into an annular shape (cylindrical shape) in conformity with the fan to be rotated. Further, the indoor unit of the ceiling concealed type includes a drain pan that is installed below the indoor heat exchanger so as to receive drain water generated as a result of condensation by the heat exchanger. The bellmouth is mounted to the drain pan through fixation with screws, and the drain pan is mounted to lateral plates of a casing (outer shell) of the indoor unit through fixation with screws. Meanwhile, the fan is fixed to a rotary shaft of a motor, and the motor is mounted to a top plate of the casing of the indoor unit (see, for example, Patent Literature 1).

Patent Literature

Patent Literature 1: Japanese Unexamined Patent Application Publication No. 2011-153749

In order to fix the bellmouth to the drain pan with screws, screw fixing brackets having threaded holes are mounted to the drain pan. Further, screw fixing brackets for allowing the drain pan to be fixed to the casing of the indoor unit are also mounted to the drain pan. In this case, the fixing brackets for allowing fixation of the bellmouth, and the fixing brackets for allowing the casing of the indoor unit and the drain pan to be fixed to each other are independent of each other. The drain pan is formed through molding of a synthetic resin, such as, polystyrene foam. Those fixing brackets are embedded at the time of, for example, molding the drain pan.

Note that, in conventional techniques, there has been no reference for mounting positions of the casing of the indoor unit and the drain pan, and for mounting positions of the drain pan and the bellmouth. For example, in the course of manufacture, when relationships between those positions vary at the time of operations of fixing the casing of the indoor unit and the drain pan to each other, and fixing the drain pan and the bellmouth to each other, there is a possibility in that a positional relationship between the casing of the indoor unit and the bellmouth widely varies in each indoor unit. The positional relationship between the casing of the indoor unit and the bellmouth has an influence on a clearance (gap) between the bellmouth and the fan. As a result, there is a risk in that indoor units **100** having nonuniform performance (unit performance) are manufactured.

SUMMARY

The present invention has been made to overcome the problems as described above, and it is an object of the present invention to provide, for example, an indoor unit having a configuration capable of suppressing variation of a clearance formed between a bellmouth and a fan.

According to one embodiment of the present invention, there is provided an indoor unit, including: a casing comprising a top plate and lateral plates; a motor mounted to a central part on an inner surface side of the top plate; a fan fixed to a rotary shaft of the motor and configured to rotate through drive of the motor; a drain pan received in the casing and mounted to the lateral plates of the casing; and a bellmouth mounted to the drain pan and configured to rectify a fluid flowing into the casing, the drain pan comprising a positioning fitting having a casing-fixing threaded hole for allowing the drain pan to be fixed to the casing with a screw; and a bellmouth-fixing threaded hole for allowing the bellmouth to be fixed to the drain pan with a screw.

Further, according to one embodiment of the present invention, there is provided an air-conditioning apparatus, including: the above-mentioned indoor unit; and an outdoor unit configured to supply heat to the indoor unit side.

According to the present invention, by having the positioning fitting having the casing-fixing threaded hole and the bellmouth-fixing threaded hole, a positional reference for the casing and the bellmouth can be directly set. With this, variation of a clearance between the turbohan and the bellmouth can be suppressed, thereby being capable of stabilizing unit performance of each indoor unit.

BRIEF DESCRIPTION OF DRAWINGS

FIG. **1** is a view for illustrating an installed state of an indoor unit **100** according to Embodiment 1 of the present invention.

FIG. **2** is a view for illustrating the structure of the indoor unit **100** according to Embodiment 1 of the present invention as viewed from an indoor side (lower surface side).

FIG. **3** is an exploded view for illustrating the indoor unit **100** according to Embodiment 1 of the present invention.

FIG. **4** is an explanatory view for illustrating a mounting relationship between a casing **120**, a drain pan **140**, and a bellmouth **160** according to Embodiment 1 of the present invention.

FIG. **5** is a view for illustrating the structure of the indoor unit **100** according to Embodiment 1 of the present invention.

FIG. **6** is a view for illustrating a positional relationship between a motor **180** and a top plate **121** according to Embodiment 1 of the present invention.

FIG. **7** is a view for illustrating a positioning fitting **143** of the drain pan **140** according to Embodiment 1 of the present invention.

FIG. **8** is a view for illustrating a relationship between the drain pan **140** and the positioning fitting **143** according to Embodiment 1 of the present invention.

FIG. **9** is a view for illustrating a relationship between the positioning fitting **143** and the bellmouth **160** according to Embodiment 1 of the present invention.

FIG. **10** is a view for illustrating a relationship between an oblong hole **143***c* and a projection portion **163** of the bellmouth **160** according to Embodiment 1 of the present invention.

FIG. **11** is a view for illustrating a configuration example of an air-conditioning apparatus according to Embodiment 3 of the present invention.

DETAILED DESCRIPTION

Now, with reference to the drawings, description is made of embodiments of the present invention. Note that, in the following drawings, the same or corresponding parts are denoted by the same reference symbols, and the same applies hereinafter. Then, the embodiments of components described herein are merely illustrative, and are not intended to be limited to those described herein. In particular, the combination of components is not limited to the combinations in the respective embodiments, and a component described in one embodiment may be applied to another embodiment. Further, only a representative one of a plurality of blades is denoted by their reference symbol. Still further, the number of the blades illustrated, for example, in the drawings is merely illustrative. In addition, the "upper side" and the "lower side" in the following description correspond respectively to the upper side and the lower side of the drawing sheets. In addition, the sizes of components relative to one another in the drawings may differ from their relative sizes in actuality.

Embodiment 1

FIG. **1** is a view for illustrating an installed state of an indoor unit **100** according to Embodiment 1 of the present invention. In this embodiment, description is made of an indoor unit **100** of a ceiling concealed type capable of being concealed in a ceiling of a room, specifically, of a four-way cassette type having air outlets **132** on four sides. Note that, the indoor unit **100** of this embodiment includes a built-in centrifugal blower. The indoor unit **100** is connected to an outdoor unit with refrigerant pipes to form a refrigerant circuit circulating refrigerant, thereby performing refrigeration, air conditioning, and other operations.

The indoor unit **100** has a casing (main unit) **120** including built-in devices configured to perform air circulation and other operations. As described later, the casing **120** includes a top plate **121** and lateral plates **122**, and is opened at a side facing an indoor side (lower side). Further, a decorative panel **130** having a substantially quadrangular shape in plan view is mounted to an opening portion of the casing **120**. The decorative panel **130** faces the indoor side (lower side), that is, a space to be air-conditioned (air-conditioning target space), for example. A grille **131** being an air inlet for air (gas) into the indoor unit **100** is arranged near a center of the decorative panel **130**. The air that has flowed through the grille **131** is subjected to dust removal by filters (not shown).

On four sides of the decorative panel **130**, the air outlets **132** are formed respectively along the four sides of the decorative panel **130**. To each of the air outlets **132**, an air outlet vane (flap) **150** is provided that serves as a louver configured to change a direction of airflow. Shafts of the air outlet vanes **150** are driven by motors (not shown) so that the air outlet vanes **150** are rotationally moved about their shafts. With this, positions of the air outlet vanes **150** are controlled. Further, in the indoor unit **100** of this embodiment, an electrical component box **101** is mounted to an outer surface side of the casing **120**.

FIG. **2** is a view for illustrating the structure of the indoor unit **100** according to Embodiment 1 of the present invention as viewed from the indoor side (lower surface side). In FIG. **2**, the decorative panel **130** is not shown as being removed, for the sake of convenience of description of a relationship with the internal structure,. As illustrated in FIG. **2**, on an air inflow side of the indoor unit **100**, specifically, on an upstream side with respect to a turbofan (centrifugal fan) **170** being a fan (impeller), a bellmouth **160** is arranged. The bellmouth **160** is configured to rectify the inflow air from the grille **131** and guide the rectified inflow air to the turbofan **170**.

A drain pan **140** is configured to collect drain water generated from an indoor heat exchanger **110** described later. The drain pan **140** is formed through molding of materials such as a synthetic resin including polystyrene foam. The bellmouth **160** is mounted to the drain pan **140**, specifically, around a position corresponding to a central portion of the lower surface of the indoor unit **100**. With this, there is formed a through-hole serving as a main-unit air inlet **124***a* configured to allow the inflow air from the grille **131** to flow therethrough. Further, there are formed through-holes serving as main-unit air outlets **124***b* configured to allow outflow air from the indoor heat exchanger **110** to flow therethrough so as to allow the outflow air to the air outlets **132**. The grille **131**, the bellmouth **160** (main-unit air inlet **124***a*), the main-unit air outlets **124***b*, and the air outlets **132** communicate to each other to form air passages in the indoor unit **100**.

FIG. **3** is an exploded view for illustrating the indoor unit **100** according to Embodiment 1 of the present invention. Further, FIG. **4** is an explanatory view for illustrating a mounting relationship between the casing **120**, the drain pan **140**, and the bellmouth **160** according to Embodiment 1 of the present invention. As illustrated in FIG. **3** and FIG. **4**, a recessed portion **141** is formed in the drain pan **140**. The bellmouth **160** is mounted to the drain pan **140** by being fitted to the recessed portion **141** and fixed thereto with screws. Further, the drain pan **140** is received in the casing **120**, and is mounted to the lateral plates **122** of the casing **120** by being fixed thereto with screws as described below.

As illustrated, for example, in FIG. **2** and FIG. **4**, the drain pan **140** includes drain-pan fixing brackets **142** having threaded holes formed so as to allow the casing **120** and the drain pan **140** to be fixed to each other with screws. Methods of fixing the drain pan **140** and the drain-pan fixing brackets **142** to each other are not particularly limited. In this embodiment, the drain-pan fixing brackets **142** are embedded into the drain pan **140** at the time of molding the drain pan **140**, for example. With this, the drain pan **140** and the drain-pan fixing brackets **142** are fixed to each other. Further, in this embodiment, device mounts **125** of the casing **120** and the drain-pan fixing brackets **142** are fixed to each other with screws. In addition, the device mounts **125** are arranged at four corners of the casing **120**, and hence the device mounts **125** and the drain-pan fixing brackets **142** are fixed to each other with screws at four positions.

Note that, in this embodiment, a positioning fitting **143** configured to allow the bellmouth **160** and the drain pan **140** to be fixed to each other with screws is arranged instead of at least one of the normal drain-pan fixing brackets **142** (at one of the corners in FIG. **2**). On one end side of the positioning fitting **143**, a casing-fixing threaded hole **143***a* for allowing the casing **120** and the drain pan **140** to be fixed to each other with a screw is formed. On another end side of the positioning fitting **143**, a bellmouth-fixing threaded hole **143***b* for allowing the drain pan **140** and the bellmouth **160** to be fixed to each other with a screw is formed. Description of the positioning fitting **143** and other components is made later.

FIG. **5** is a view for illustrating the structure of the indoor unit **100** according to Embodiment 1 of the present invention. On a downstream side of air streams with respect to the turbofan **170**, the indoor heat exchanger **110** of, for example, a fin-and-tube type is arranged so as to surround the turbofan **170**. When the indoor unit **100** of this embodiment is applied, for example, to an air-conditioning apparatus, the indoor heat exchanger **110** serves as an evaporator during a cooling operation, and serves as a condenser during a heating operation.

FIG. **6** is a view illustrating a positional relationship between a motor **180** and the top plate **121** according to Embodiment 1 of the present invention. As described above, the casing **120** includes the top plate **121** and the lateral plates **122**. The motor **180** built in the main unit of the indoor unit **100** is mounted to the top plate **121** so that a central part of the top plate **121** and a rotary shaft **181** are orthogonal to each other. The rotary shaft **181** extends, for example, in a vertical direction. Note that, the motor **180** may be mounted to the top plate **121** so as to be held in contact therewith, or may be mounted to the top plate **121** with a slight clearance therebetween.

Further, the turbofan **170** illustrated in FIG. **5** is an impeller to be used in a blower of a centrifugal type. The turbofan **170** is mounted to the rotary shaft **181** of the motor **180**. Along with rotation of the turbofan **170**, air streams for conveying the air, which is taken in through the grille **131**, toward lateral sides (right-and-left direction in FIG. **5**) are generated. Further, as described above, the bellmouth **160** forms the inlet-side air passage to the turbofan **170**. As illustrated in FIG. **5**, the bellmouth **160** and the turbofan **170** are partially overlapped with each other in an upper-and-lower direction. In addition, in the overlapping part, a clearance (gap) **190** is secured so as to prevent, for example, contact between the bellmouth **160** and the turbofan **170**. When a positional relationship between the bellmouth **160** and the turbofan **170** is improper, the clearance **190** may vary in each indoor unit **100**. As a result, there is a risk in that indoor units **100** having nonunform unit performance are manufactured. In this embodiment, the positioning fitting **143** is used so as to enhance accuracy in arranging the bellmouth **160** with respect to the turbofan **170**, thereby suppressing the variation of the clearances **190** from one indoor unit **100** to another. With this, the indoor units **100** having stable unit performance can be provided.

FIG. **7** is a view illustrating the positioning fitting **143** of the drain pan **140** according to Embodiment 1 of the present invention. As described above, the positioning fitting **143** has the casing-fixing threaded hole **143***a* and the bellmouth-fixing threaded hole **143***b* at both the ends so that the casing **120** and the drain pan **140** are fixed to each other with a screw at the one end, and that the drain pan **140** and the bellmouth **160** are fixed to each other with a screw at the other end. As illustrated in FIG. **7**, the positioning fitting **143** of this embodiment is formed through processing of a single sheet metal (metal plate). For example, when the casing **120** and the drain pan **140**, and the drain pan **140** and the bellmouth **160** are respectively fixed with screws through intermediation of independent fixing brackets as in the related art, variation of positions between the fixing brackets (threaded holes) has a direct influence on the variation of the clearances **190** between the turbofan **170** and the bellmouth **160**. In this embodiment, the positioning fitting **143** integrally including the fixing brackets having the threaded holes for allowing the casing **120** and the drain pan **140**, and the drain pan **140** and the bellmouth **160** to be respectively fixed to each other with screws is formed by processing a single sheet metal. With this, a positional reference between the casing **120** and the bellmouth **160** (positional relationship between the threaded holes) can be directly set.

FIG. **8** is a view for illustrating a relationship between the drain pan **140** and the positioning fitting **143** according to Embodiment 1 of the present invention. Note that, in FIG. **8**, a part of the positioning fitting **143**, which is actually embedded in the drain pan **140**, is also illustrated. The positioning fitting **143** of this embodiment is processed into a stepped shape in which the casing-fixing threaded hole **143***a* for allowing the casing **120** and the drain pan **140** to be fixed to each other with a screw is positioned so as to be flush with a lower surface side of the drain pan **140**, and in which the bellmouth-fixing threaded hole **143***b* for allowing the drain pan **140** and the bellmouth **160** to be fixed to each other with a screw is positioned on a bottom surface of the recessed portion **141**.

FIG. **9** is a view for illustrating a relationship between the positioning fitting **143** and the bellmouth **160** according to Embodiment 1 of the present invention. In this embodiment, a threaded hole **162** corresponding to the bellmouth-fixing threaded hole **143***b* of the positioning fitting **143** is formed at a part (threaded hole forming portion **164**) corresponding to one of the four corners of the bellmouth **160** to be mounted to the drain pan **140**. In the bellmouth **160** of this embodiment, the threaded hole forming portion **164** having the threaded hole **162** is formed into a shape different from those of other corners. With this, a direction of mounting the bellmouth **160** to the drain pan **140** can be easily recognized by sight. A screw **191** is inserted into the threaded hole **162** and the bellmouth-fixing threaded hole **143***b*, and is then fastened. With this, the bellmouth **160** is fixed.

Further, the positioning fitting **143** has not only the bellmouth-fixing threaded hole **143***b* but also an oblong hole **143***c* for allowing the bellmouth **160** to be positioned. In addition, the drain pan **140** has a recessed portion **144** formed in conformity with the oblong hole **143***c*.

FIG. **10** is a view illustrating a relationship between the oblong hole **143***c* and a projection portion **163** of the bellmouth **160** according to Embodiment 1 of the present invention. As illustrated in FIG. **10**, in the threaded hole forming portion **164** of the bellmouth **160**, the projection portion **163** to be fitted into the oblong hole **143***c* of the positioning fitting **143** so as to fix the bellmouth **160** is formed on an opposed surface side with respect to the drain pan **140**. When, for example, the drain pan **140** and the bellmouth **160** are fixed to each other only with the screw **191**, there is a risk in that the bellmouth **160** is rotationally moved in a horizontal direction about the screw **191** (bellmouth-fixing threaded hole **143***b*). As a countermeasure, the projection portion **163** is inserted into the oblong hole **143***c* (recessed portion **144**) so that the horizontal rotational movement of the bellmouth **160**, which may occur only with the fixation with the screw, is restricted. Further, both the threaded hole **162** and the projection portion **163** are formed in the threaded hole forming portion **164**. Thus, the bellmouth **160** can be positioned only by fixing the single position with the screw **191** coaxially with the threaded hole **162** (note that, other parts of the bellmouth **160** may be vibrated in the upper-and-lower direction, and hence, in this embodiment, the other parts are also fixed with screws).

Note that, in this embodiment, although the oblong hole **143***c* is formed into a rectangular shape, and the projection portion **163** is formed into a rectangular parallelepiped shape, those shapes of the oblong hole **143***c* and the projection portion **163** are not particularly limited. However, a columnar shape needs to be avoided because, even when the columnar projection portion **163** is inserted into the oblong hole **143***c*, the rotation of the bellmouth **160** cannot be restricted. Further, for example, an effect of the restriction is increased as one side of the oblong hole **143***c* is formed so as to be longer than another side.

As described above, in the indoor unit **100** of this embodiment, the drain pan **140** includes the single positioning fitting **143** having the casing-fixing threaded hole **143***a* for allowing the drain pan **140** and the lateral plate **122** of the casing **120** to be fixed to each other with a screw, and the bellmouth-fixing threaded hole **143***b* for allowing the drain pan **140** and the bellmouth **160** to be fixed to each other with a screw. With this, the positional reference between the casing **120** and the bellmouth **160** can be directly set. Thus, a relationship between positions at which the drain pan **140** and the lateral plates **122** of the casing **120** are fixed to each other with screws and positions at which the drain pan **140** and the bellmouth **160** are fixed to each other with screws does not vary in each indoor unit **100**. As a result, the variation of the clearance **190** between the turbofan **170** and the bellmouth **160** can be suppressed, thereby being capable of stabilizing the unit performance of each indoor unit **100**.

Further, the projection portion **163** formed on the bellmouth **160** side is fitted into the oblong hole **143***c* and the recessed portion **144** formed on the drain pan **140** side. With this, the rotational movement of the bellmouth **160** can be restricted, and a positional relationship between the bellmouth **160** and the drain pan **140** can be maintained.

Embodiment 2

In Embodiment 1 described above, the positioning fitting **143** is formed through processing of a sheet metal. However, the present invention is not limited thereto. For example, the positioning fitting **143** may be formed through molding of a resin material.

Embodiment 3

FIG. **11** is a view for illustrating a configuration example of an air-conditioning apparatus according to Embodiment 3 of the present invention. Note that, in FIG. **11**, the air-conditioning apparatus is illustrated as an example of a refrigeration cycle apparatus. In FIG. **11**, the same components as those illustrated in, for example, other figures perform the same operations. In the air-conditioning apparatus of FIG. **11**, an outdoor unit **200** and the indoor unit **100** are connected to each other by pipes including a gas refrigerant pipe **300** and a liquid refrigerant pipe **400**. The outdoor unit **200** includes a compressor **210**, a four-way valve **220**, an outdoor heat exchanger **230**, and an expansion valve **240**.

The compressor **210** is configured to compress and discharge sucked refrigerant. Note that, the compressor **210** is not particularly limited, but may include, for example, an inverter circuit so that an operating frequency thereof is arbitrarily changed, thereby being capable of changing a capacity of the compressor **210** (amount of refrigerant sent per unit time). The four-way valve **220** is a valve configured to switch flow of the refrigerant during the cooling operation and flow of the refrigerant during the heating operation to each other, for example.

The outdoor heat exchanger **230** of this embodiment is configured to exchange heat between the refrigerant and the air (outside air). Specifically, the outdoor heat exchanger **230** functions as an evaporator during the heating operation so as to evaporate and gasify the refrigerant, and functions as a condenser during the cooling operation so as to condense and liquefy the refrigerant.

The expansion valve **240** such as an expansion device (flow rate control unit) is configured to decompress and expand the refrigerant. For example, when the expansion valve **240** is constructed by an electronic expansion valve, an opening degree thereof is controlled in response to instructions from a controller (not shown), for example. The indoor heat exchanger **110** is configured to exchange heat between the air to be air-conditioned and the refrigerant, for example. The indoor heat exchanger **110** functions as the condenser during the heating operation so as to condense and liquefy the refrigerant, and functions as the evaporator during the cooling operation so as to evaporate and gasify the refrigerant.

First, description is made of how the refrigerant flows during the cooling operation in the refrigeration cycle apparatus. During the cooling operation, the four-way valve **220** is switched so as to establish a connection relationship as indicated by the solid arrows. Gas refrigerant that has been increased in temperature and pressure through compression by the compressor **210** is discharged therefrom, and then flows into the outdoor heat exchanger **230** via the four-way valve **220**. Next, the gas refrigerant is condensed and liquefied into liquid refrigerant through the heat exchange with the outside air by flowing through the outdoor heat exchanger **230**, and then flows into the expansion valve **240**. The liquid refrigerant turns into refrigerant in a two-phase gas-liquid state through decompression by the expansion valve **240**, and then flows out of the outdoor unit **200**.

The two-phase gas-liquid refrigerant that has flowed out of the outdoor unit **200** flows into the indoor unit **100** through the liquid refrigerant pipe **400**. Next, the two-phase gas-liquid refrigerant is distributed by a distributor and a flow rate control capillary tube (not shown), and then flows into the indoor heat exchanger **110**. The two-phase gas-liquid refrigerant turns into gas refrigerant through evaporation and gasification by the heat exchange with, for example, the air to be air-conditioned by flowing through the indoor heat exchanger **110** as described above, and then flows out of the indoor unit **100**.

The gas refrigerant that has flowed out of the indoor unit **100** flows into the outdoor unit **200** through the gas refrigerant pipe **300**. Then, the gas refrigerant is sucked again into the compressor **210** via the four-way valve **220**. Air-conditioning (cooling) is performed by circulating the refrigerant in the air-conditioning apparatus in this way.

Next, description is made of how the refrigerant flows during the heating operation. During the heating operation, the four-way valve **220** is switched so as to establish a connection relationship as indicated by the dotted arrows. Gas refrigerant that has been increased in temperature and pressure through compression by the compressor **210** is discharged therefrom, and then flows out of the outdoor unit **200** via the four-way valve **220**. The gas refrigerant that has flowed out of the outdoor unit **200** flows into the indoor unit **100** through the gas refrigerant pipe **300**.

The gas refrigerant is condensed and liquefied through the heat exchange with, for example, the air to be air-conditioned by flowing through the indoor heat exchanger **110**, and then flows out of the indoor unit **100** through the distributor and the flow rate control capillary tube (not shown).

The liquid refrigerant that has flowed out of the indoor unit **100** flows into the outdoor unit **200** through the liquid refrigerant pipe **400**. Then, the liquid refrigerant turns into refrigerant in the two-phase gas-liquid state through the decompression by the expansion valve **240**, and then flows into the outdoor heat exchanger **230**. Next, the refrigerant is gasified (gas refrigerant) through evaporation and the heat exchange with the outside air by flowing through the outdoor heat exchanger **230**. Then, the refrigerant is sucked again into the compressor **210** via the four-way valve **220**. Air-conditioning (heating) is performed by circulating the refrigerant in the air-conditioning apparatus in this way.

As described above, in the air-conditioning apparatus (refrigeration cycle apparatus) of this embodiment, the indoor unit **100** described above is used. With this, air-conditioning apparatus having stable unit performance can be provided.

INDUSTRIAL APPLICABILITY

The indoor unit **100** of the embodiments described above is an indoor unit of the four-way cassette type having the four air outlets **132** and the four air outlet vanes **150** so as to flow out air to four sides. However, the present invention is not limited thereto, and is applicable also to, for example, indoor units of other ceiling concealed types adaptable to two-way or three-way air stream. Further, the present invention is applicable not only to the indoor units of such ceiling concealed types, but also to indoor units of other types. In addition, the present invention is applicable also to fans other than the centrifugal fan.

Still further, in the embodiments described above, the air-conditioning apparatus is described as an example of the refrigeration cycle apparatus. However, the present invention is not limited thereto, and is applicable also to, for example, other refrigeration cycle apparatus such as a dehumidifier. In addition, the present invention is applicable not only to the refrigeration cycle apparatus, but also to, for example, blowers and ventilation systems.

The invention claimed is:

1. An indoor unit, comprising:

a casing comprising a top plate and lateral plates;

a motor mounted to a central part on an inner surface side of the top plate;

a fan fixed to a rotary shaft of the motor and configured to rotate through drive of the motor;

a drain pan received in the casing and mounted to the lateral plates of the casing; and

a bellmouth mounted to the drain pan and configured to rectify a fluid flowing into the casing,

the drain pan comprising a positioning fitting having

a casing-fixing threaded hole for allowing the drain pan to be fixed to the casing with a screw; and

a bellmouth-fixing threaded hole for allowing the bellmouth to be fixed to the drain pan with a screw,

wherein

the positioning fitting has an oblong hole for allowing the bellmouth to be positioned in conjunction with the bellmouth-fixing threaded hole,

the drain pan has a recessed portion conforming to the oblong hole, and

the bellmouth has a projection portion to be fitted into the recessed portion through the oblong hole.

2. The indoor unit of claim **1**, wherein the bellmouth and the drain pan are positioned to each other at one position.

3. The indoor unit of claim **2**, wherein the positioning fitting is formed by processing a metal plate or a resin.

4. The indoor unit of claim **1**, wherein the positioning fitting is formed by processing a metal plate or a resin.

5. An air-conditioning apparatus, comprising:

the indoor unit of claim **1**; and

an outdoor unit configured to supply heat to the indoor unit side.

6. An air-conditioning apparatus, comprising:

the indoor unit of claim **2**;

an outdoor unit configured to supply heat to the indoor unit side.

7. An air-conditioning apparatus, comprising:

the indoor unit of claim **4**;

an outdoor unit configured to supply heat to the indoor unit side.

* * * * *